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IS 10809 (1984): Hydraulic Rams [FAD 17: Farm Irrigation and Drainage Systems]

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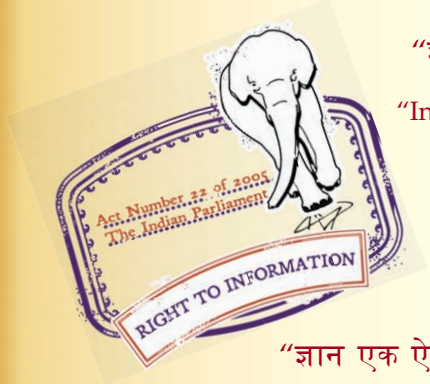

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS : 10809 - 1984
(Reaffirmed 2000)

Indian Standard

SPECIFICATION FOR HYDRAULIC RAMS

UDC : 621·227

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard

SPECIFICATION FOR HYDRAULIC RAMS

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Indian Standard

SPECIFICATION FOR HYDRAULIC RAMS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 17 February 1984, after the draft finalized by the Irrigation Equipment and Systems Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Problems are being faced in enhancing irrigation facilities in hilly areas mainly due to their highly uneven topography. Difficulties are faced in using conventional methods of lifting water by engine or electric motor driven pump sets. Keeping in view the problems of the hills like lack of proper transportation and high recurring cost of the pump sets, a need was felt to design some new, economical and effective water lifting device. A hydraulic ram (abbreviated as hydram) may meet these requirements and can pump water to greater height without any external source of energy in the form of fuel or electricity. The hydraulic ram utilizes low head of large amount of water to pump proportionately smaller quantity of water to a higher head on the principle of converting the kinetic energy of flowing water to pressure energy through its automatic and intermittent stopping and flowing creating, water hammer.

0.3 Considering the vast potential of hydraulic rams in hilly areas, research, manufacturing and use of hydrams were intensified. A need was, therefore, felt to formulate an Indian Standard on the subject to specify various quality characteristics of the hydrams.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard specifies material, sizes, performance and other requirements of hydraulic rams.

*Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definition shall apply.

2.1 Hydraulic Ram — An automatic device with which the energy of a quantity of water with small head is used to lift proportionate quantity of this water to a greater height. It works on the principle of water hammer.

2.2 Size — Size of the hydraulic ram shall be expressed in terms of nominal size of intake pipe and delivery pipe expressed in mm, such as 50×25 mm, and 100×50 mm.

2.3 Lift Magnification — The ratio of the delivery head to the intake head. It is also known as magnification factor.

3. TYPES

3.1 For the purpose of this standard, the hydrams shall be vertical or horizontal type.

4. SIZE

4.1 The nominal size of the hydrams shall be 50×25 mm, 75×38 mm 100×50 mm, 150×75 mm, 200×100 mm and 300×150 mm.

5. MATERIAL

5.1 The material of construction of various components of the hydram shall be as given in col 3 of Table 1. The material may conform to the relevant Indian Standard given in col 4 of Table 1.

TABLE 1 MATERIAL OF CONSTRUCTION

Sl No. (1)	Component (2)	Material (3)	Applicable Indian Standard (4)
i)	Body	Cast iron	210-1978*
ii)	Air chamber	Cast iron	210-1978*
		Mild steel	226-1975†
iii)	Gate valve	Cast iron	210-1978*
		Synthetic rubber	—
iv)	Brackets	Mild steel	226-1975†
v)	Pins	Stainless steel	6603-1972‡
vi)	Flange	Cast iron	210-1978*
vii)	Starting handle	Cast iron	210-1978*
		Mild steel	226-1975†
viii)	Delivery valve		
	a) Body	Cast iron	210-1978*
	b) Valve	Mild steel	226-1975†
	c) Rod	Stainless steel	6603-1972‡
	d) Bush	Tin bronze	318-1981§
		Synthetic rubber	—
		Natural rubber	

* Specification or grey iron castings (*third revision*).
† Specification for structural steel (standard quality) (*fifth revision*).
‡ Specification for stainless steel bars and flats.
§ Specification for leaded tin bronze ingots and castings (*second revision*).

6. PERFORMANCE

6.1 Discharge — The discharge of water depends mainly on the size of the hydram and lift magnification. The test set-up for discharge is shown in Fig. 1.

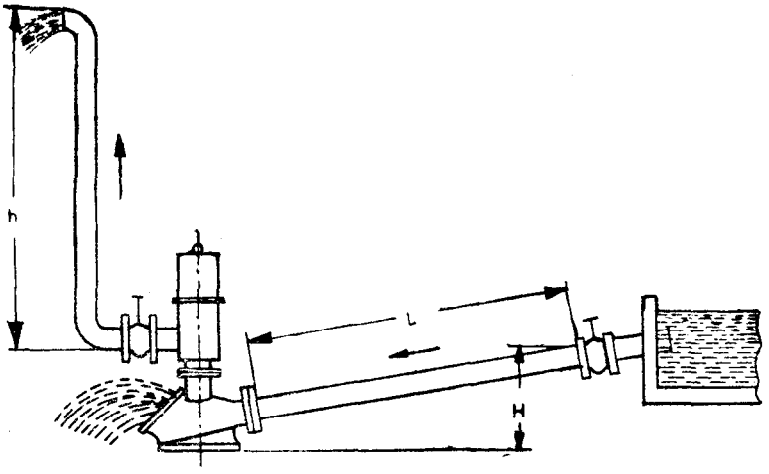

FIG. 1 TEST SETUP FOR MEASURING HYDRAM DISCHARGE

6.1.1 The discharge with respect to the size and lift magnification shall be declared by the manufacturer. The declared value shall not differ by ± 5 percent.

6.1.2 For certain sizes and lift magnification, the discharge rate has been given in Table 2 for guidance.

TABLE 2 DISCHARGE RATE

SL NO.	LIFT MAGNIFICATION	WATER INPUT (1/min)					
		90	210	350	850	1 500	3 500
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	4	18·2	41	76	170	350	785
ii)	6	14·2	32	60	135	300	675
iii)	8	11·0	25	46	100	250	580
iv)	10	9·0	20	38	85	210	520
v)	15	6·6	15	28	65	160	450
vi)	20	4·4	10	18	40	130	390
vii)	25	3·8	8·5	16	35	110	350
viii)	30	2·6	6	11	25	85	280

NOTE — Under similar conditions, the discharge of the hydram increases approximately proportionally to the cross sectional areas of the intake pipe subject to the marginal increase due to increase in the efficiency.

6.2 Efficiency — The efficiency of the hydram shall be calculated on the basis of following formula:

$$\mu = \frac{Q \times h}{W \times H} \times 100$$

where

μ = efficiency, expressed in percentage;
W = quantity of water flowing through intake pipe;
H = intake head;
Q = discharge; and
h = delivery head.

6.2.1 The efficiency of hydram form various lift magnification shall be as given in Table 3.

TABLE 3 EFFICIENCY

Sl No.	Lift Magnification	Efficiency, Percent
(1)	(2)	(3)
i)	Up to 3	85
ii)	4	80
iii)	5 and 6	75
iv)	7	70
v)	8 and 9	65
vi)	10 and 12	60
vii)	14 and 15	55
viii)	16 and 18	45
ix)	20 and 25	40
x)	30	35

7. OTHER REQUIREMENTS

7.1 The connection for intake pipe shall be such that the pipe when fitted shall form an angle of 7°.

7.2 The cross sectional area of waste water opening should be more than the cross section of the intake pipe.

7.3 The air chamber shall withstand without bursting, a hydraulic pressure of minimum 1 800 kPa.

8. WORKMANSHIP AND FINISH

8.1 The components of the hydram shall be free from pits, burrs, cracks and other visual defects.

8.2 The hydram shall be painted.

9. MARKING AND PACKING

9.1 Marking — Each hydram shall be marked with the following particulars:

a) Name of the manufacturers,

b) Size, and

c) Batch, code or serial number.

9.1.1 The hydrams may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

9.2 The hydram may be packed for safe handling in transit as agreed to between the purchaser and the supplier.

10. SAMPLING FOR LOT ACCEPTANCE

10.1 Unless otherwise agreed to between the purchaser and the supplier, the sampling of hydram for lot acceptance shall be done in accordance with 3 of IS : 7201-1975*.

*Method of sampling of agricultural machinery and tractors.